

Lean official statistics concept based on the working conditions survey

Jerzy Auksztol^a

Abstract. The Lean approach refers to the elimination of waste from the value stream. In other words, it excludes any activities which fail to be of any value to the client, thus enabling an organisation to adapt to the growing customer demands while providing high quality products and keeping unit costs under control. The aim of this paper is to assess the possibility of applying the Lean concept in official statistics on the basis of the working conditions survey, which is characterised by an increasing number of the surveyed units and a growing scope of the collected data. The implementation of the Lean concept within the working conditions survey began in 2017 as a pilot project with the aim to reduce the labour intensity that the survey involves. The research methods used in the paper were case study and the Design Science Research. The case study covered the period from 1987 to 2019 and related to the operational areas of the survey, such as its completeness, the number of reporting units and the scope of the collected variables. In order to present the topic in a broader context, additional data were also used, namely the wages and salaries of selected groups of professions, such as IT specialists. The obtained results confirm that the Lean approach is an effective tool applicable in the process of limiting respondent burden. It facilitates the modernisation of the working conditions survey through the elimination of any unnecessary work while maintaining the usefulness of the final results. It may therefore form the foundation for the construction of lean official statistics.

Keywords: Lean approach in official statistics, working conditions survey, respondent burden

JEL: J81, H83

Koncepcja oszczędnej statystyki publicznej na przykładzie badania warunków pracy

Streszczenie. Podejście oszczędnościowe (ang. *Lean approach*) odnosi się do eliminowania marnotrawstwa z łańcucha wartości, inaczej mówiąc, polega na rezygnacji z działań, które nie wnoszą wartości istotnej dla klienta. Dzięki temu organizacja stosująca to podejście może dopasować się do rosnących wymagań klientów przy zapewnieniu wysokiej jakości produktów końcowych i jednoczesnym kontrolowaniu kosztów jednostkowych. Celem niniejszego artykułu jest ocena możliwości wykorzystania koncepcji oszczędnościowej w statystyce publicznej na przykładzie badania warunków pracy, które charakteryzuje się stałym wzrostem liczby badanych jednostek oraz powiększającym się zakresem zbieranych danych. Wdrażane w jego ramach podejście oszczędnościowe, rozpoczęte jako projekt pilotażowy w 2017 r., ma przynieść ograniczenie pracochłonności badania. Jako metody badawcze w artykule wykorzystano stu-

^a Uniwersytet Gdański, Wydział Zarządzania; Urząd Statystyczny w Gdańsku, Polska / University of Gdańsk, Faculty of Management; Statistical Office in Gdańsk, Poland.
ORCID: <https://orcid.org/0000-0002-8138-6261>. E-mail: jerzy.auksztol@ug.edu.pl.

dium przypadku oraz podejście projektowe. Studium przypadku objęło okres od 1987 r. do 2019 r. i dotyczyło obszarów operacyjnych badania, takich jak jego kompletność, liczba badanych jednostek oraz zakres zbieranych zmiennych. Aby uzyskać szerszy kontekst, posłużono się również danymi uzupełniającymi na temat wynagrodzeń wybranych grup zawodów, np. informatyków. W wyniku przeprowadzonej oceny uzyskano potwierdzenie, że podejście oszczędnościowe jest skutecznym narzędziem w procesie ograniczania obciążeń respondentów. Wspomaga modernizację badania warunków pracy w kierunku eliminacji niepotrzebnych działań, nie umniejszając przydatności wyników końcowych, może zatem stworzyć podwaliny pod budowę oszczędnej statystyki publicznej.

Słowa kluczowe: koncepcja oszczędnościowa w statystyce publicznej, badanie warunków pracy, obciążenie respondenta

1. Introduction

Numerous discussions were held within official statistics on how to reduce respondent burden (Sharp & Frankel, 1983). However, due to the growing expectations of the users of reliable statistical data, this issue has become a significant challenge that the community of statisticians is faced with. In response to this challenge, Statistics Poland launched a pilot project to reduce the burden borne by the respondents of the working conditions survey. The Lean concept, a well-established in the private sector method of eliminating unnecessary activities and thus contributing to the enhancement of the efficiency of the conducted operations, was selected as the methodological framework for the undertaken activities. Therefore, the paper seeks to answer the following research question: Can the Lean concept be successfully implemented in official statistics, where the available human and material resources are not sufficient enough to meet the broad expectations of the stakeholders?

The above will to some extent follow the research issues initiated by Radnor and Osborne (2013), recognised researchers of the Lean concept, who assessed its effectiveness when introduced in the public administration reform. They noted that the slogan promoting the launch of the Lean implementation process was to be able to 'do more with less' (Radnor & Osborne, 2013, p. 266), which was a promise encouraging action.

The aim of this paper is to assess the possibility of applying the Lean concept in official statistics. It discusses the activities undertaken within a relatively narrow scope of one of the surveys conducted by Statistics Poland, proposing directions for further initiatives. The working conditions survey will be used to assess the effectiveness of the implementation of the Lean approach in official statistics, with a prospect of extending it to other fields of research carried out by Statistics Poland.

2. The challenges of official statistics

The author's experience in the field of research processes carried out by official statistics indicates that they undergo constant multicausal changes resulting from the emergence of new social, economic and environmental phenomena. The observers of these phenomena signal the need to monitor them in quantitative terms. The increasing complexity of these events and their interpenetration make the recipients' expectations grow steadily, which, in turn, poses constant and multidimensional challenges to official statistics. The most important ones include: the intense digitalisation of communication in social and economic life, the increasing scope of data collected by public and private sectors, the growing expectations of the users of statistical data, the respondents' proposal to limit reporting obligations, the need to improve the wage- and non-wage-related conditions of the employees of official statistics and the COVID-19 crisis. Each of the raised issues is discussed below:

1. The intense digitalisation of communication in social and economic life allows official statistics to greatly benefit from Information and Communication Technology (ICT) tools, which increase the efficiency of the collection, analysis, publishing and disseminating of data. Over the years, the use of ICT in official statistics has been growing steadily. In Poland, the following events mark the milestones of digitalisation: (a) the efficient and effective introduction of electronic reporting in 2008–2009, (b) the 2011 census carried out with the use of IT tools or the application of Geographic Information Systems and (c) conducting the 2021 National Population and Housing Census using an Internet-based method as the primary method of filling in census questionnaires. The data collected in this way are processed and made available in centralised databases, thus enabling users to freely access the full range of statistical information. Technologies such as big data create new opportunities for the development of data acquisition methods which are to a great extent likely to decrease respondent burden while reducing subjective evaluation errors. These methods include e.g. estimating crops on the basis of satellite images or direct access to measuring devices in road transport. Digitalisation also contributes to expanding the scope of the studied phenomena. Work is currently underway to use datasets collected by mobile operators in order to estimate the actual number of inhabitants, population movements and the directions of urban gravity.
2. The growing scope of data collected by the public and private sector is a direct effect of the digitalisation of communication in social and economic life and results in providing registries with a wide range of data on entities, material objects, processes or events. This way official statistics gains access to many sorted datasets, thus extending the statistical survey database, while at the same time

entities' statistical obligations become limited. This is illustrated by the example of some higher education institutions which ceased to submit selected reports after the relevant ministry introduced an information system collecting microdata on students, lecturers and certain processes carried out by universities and research units. However, the full potential of the registers is not reached due to the occurrence of numerous obstacles resulting from the divergent goals set by administrators and official statistics. One of them includes a different approach to assessing the quality of the collected data, e.g. administrators limit the implementation of classifications and nomenclatures required by statistical offices, e.g. TERYT (National Official Register of the Territorial Division of the Country), which prevents the full integration of datasets.

3. The growing expectations of the users of statistical data are visible in their proposals to extend official statistics' research initiatives, which results from the need to monitor the constantly emerging phenomena. The new, legitimate proposals for extending the statistical survey programme hardly go hand in hand with the process of evaluating the usefulness of the currently ongoing projects. In effect, there is a systematic increase in the scope and number of statistical surveys carried out by official statistics and additional reporting obligations are imposed upon the surveyed entities. The number of variables collected in the report on working conditions between 1987 and the peak year 2007 grew substantially from 90 to as many as 162 variables, respectively, which only confirms the thesis above.
4. The proposal to limit reporting obligations is put forward by the respondents who raise the issue of an overload of statistical surveys. They point to high tangible and personnel costs that the collection and submitting of reports generate. This is undoubtedly an adverse effect of the growing expectations of statistical data users, in many cases leading to broader reporting obligations.
5. The prevailing issue in discussions held at statistical offices is the need to improve wage- and non-wage-related working conditions among the services of official statistics. This situation is the direct effect of the changes taking place on the labour market. Official statistics faces difficulties in recruiting employees with high analytical qualifications while at the same time constant increases in wages and salaries are observed in the national economy. The image of official statistics should therefore be shaped so as to promote the institution as an attractive and stable workplace for prospective applicants.
6. The COVID-19 crisis and the required social distancing had a significant impact on the functioning of the official statistic system. There has been a complete cessation of the direct method of data collection (i.e. face-to-face surveys), which has been shifted to telephone and internet channels. Statisticians have also switched to remote work, thereby changing internal processes. The proposal to

reduce respondent burden in difficult times of crisis has been reinforced. On the other hand, there has been an increased pressure to expand the scope of the presented statistics in terms of the demographic, social, economic and even environmental effects of the crisis (MacFeely, 2020, pp. 1088–1089). In addition, official statistics is required to participate in the process of monitoring the transformation and economic recovery of national economies, which makes the statistical community responsible for the credibility and adequacy of the data provided.¹

The descriptions of the selected challenges faced by official statistics indicate the existence of many contradictions difficult to reconcile. On the one hand, the expectations of a wide group of stakeholders are growing. Policymakers emphasise the need to obtain reliable data required to establish effective social, economic and climate programmes. Scientists and researchers point to the need for detailed data essential to produce useful analyses and theories in a relevant and rigorous manner. On the other hand, an increasing resistance is observed among respondents whose participation in preparing the expected statistical compilations is vital. This objection is compounded by the official statistics staff who realise that the expansion of the statistical survey programme requires additional workload, which at the same time does not entail a budget increase. This results in a constant decline in the wage-related working conditions. These conflicting forces exerting pressure on official statistics have been reinforced greatly during the COVID-19 crisis.

The restructuring of administrative processes based on ICT is a frequently proposed solution to the above-mentioned issues, which in the case of statistical data creates opportunities for a significant improvement in their efficiency. It should be emphasised that such activities have already been undertaken, which was mentioned when discussing the challenges facing official statistics. However, a contradiction may be observed here. The Structure of Earnings Survey – SES (Główny Urząd Statystyczny [GUS], 2020a) indicates that employees working in IT professions are remunerated well above the national average wages and salaries. Thus, the average salary of ‘Software and applications developers and analysts’ (code 251 in the ISCO-08 classification) stood at 190% of the average national figure in October 2018, while ‘Database and network professionals’ (code 252 in the ISCO-08 classification) earned 161.5% of the average pay in the same time. This means that the restructuring of official statistics processes towards their digitalisation results in increased budgetary expenditure covering the costs of hiring staff whose earnings

¹ Woodruff (1997) proposed a definition of the term *customer value* based on a review of approaches present in the literature. Thus, he pointed to important components of the term, not recognised in the discourse on Lean thinking but important from the point of view of official statistics, e.g. product attributes that block achieving the goals.

exceed the average pay. The use of modern ICT, including big data, involves shifting from traditional forms of work to fully automated solutions. However, this requires a change in the employment structure and a greater use of the services of highly skilled data analysts earning high salaries.

The use of administrative registers is another commonly discussed solution. Many contradictions occur within this issue as well. On the one hand, their application provides an attractive opportunity for increasing official statistics resources with data collected by other units for their own purposes, while at the same time limiting the reporting obligations imposed on respondents. On the other hand, the system's inertia is noticeable, where the available IT system is not adjusted to the needs expressed by the official statistics community, which means that it cannot be used to its fullest and the respondents' reporting obligations must be maintained. The survey on the structure of wages and salaries by occupations may serve as an example here. The survey could be supplied with data collected in Social Security Institution datasets. However, the inertia occurring when additional information is entered into these datasets, such as occupation codes, education or the amount of remuneration and not only social security contributions, necessitates leaving the obligation of filling in the complex reports to randomly selected entities. The use of administrative registers also requires pay rises, as only employees with high data analysis competences are able to cope with the adoption, cleaning and adjustment of large datasets of a diversified structure to the needs of official statistics.

The challenges and the resulting contradictions have been recognised, although their comprehensive identification and the implementation of any relevant initiatives are delayed; thus the tension remains high, creating appropriate conditions for its constant growth.

Social sciences may prove helpful in the search for solutions to the discussed contradictions, offering numerous concepts of a systematic approach to describing organisational behaviour. One of them is the organisational paradox theory described by Smith and Lewis (2011), which will be helpful in the adoption of a specific theoretical perspective to the understanding of the essence of the contradictions occurring in official statistics. Smith and Lewis (2011, p. 382) define paradox as 'contradictory, yet interrelated elements that exist simultaneously and persist over time'. This definition reflects the essence of the challenges and contradictions recognised by official statistics, where the users expect more and the respondents less, while resources guaranteed by the state budget are limited. This paradox can be described as 'more results with fewer resources' or 'more-with-fewer' in short. In search of solutions to this paradox, we propose the Lean approach, which is a well-established concept used to improve manufacturing, services and administrative processes.

3. The Lean approach

3.1. The essence of Lean

The Lean concept was initiated in the 1970s (Sugimori et al., 1977) and is continuously being developed (Stone, 2012) in a wide range of sectors, from manufacturing, through services, to public administration. The concept, originated in the automobile industry sector (Piercy & Rich, 2009, p. 55), served to identify the factors of the success of the Japanese car manufacturers, juxtaposed with their American counterparts. It was determined that the ability to adapt to the growing customer demands while maintaining the high quality of products and keeping unit costs under control were the reasons behind the Japanese car industry's success, which was treated as a paradox difficult to reconcile. These practices were called the Toyota Production System (TPS; Holweg, 2007, pp. 421–423) and based on the idea of eliminating waste from the value stream (Lander & Liker, 2007, p. 3681). This can be achieved in a learning organisation characterised by a clear vision of ensuring continuous material flow, precise principles of operational guidance and effective methods of solving specific problems (Towill, 2010, p. 331).

3.2. Lean principles

The general Lean principles are based on the term customer value. A precise definition of it was provided by Woodruff (1997) and developed on the basis of an extensive literature review. It reads as follows: 'customer value is a customer's perceived preference for and evaluation of those product attributes, attribute performances, and consequences arising from use that facilitate (or block) achieving the customer's goals and purposes in use situations' (Woodruff, 1997, p. 142). Customer value is supplemented by the term value stream, which encompasses activities that result in the transformation of raw materials into a product, i.e. goods or services (Womack & Jones, 1996, p. 19). The convergence of the semantic extension (Kotarbiński, 1929), i.e. the scope of the notion of the value stream, with another related term called business process is noticeable here, therefore these terms will be used interchangeably in the article, with a preference for business processes, which is more firmly established in the literature.

Lean principles are specified in a widely cited paper by Womack and Jones (1996), which presents them according to a good practices formula meant to support the management and employees of an organisation in achieving the final outcomes. These provide guidelines for activities undertaken on a cyclical basis:

- specify the value significant to the customer;
- identify the value stream eliminating the steps where no value is added;
- streamline the flow of products and information;

- introduce the pull system, within which the products are delivered only when they are expected (pulled) by the customer;
- pursue perfection through continued improvements with the aim of no waste occurring.

3.3. Waste recognition

The key task in Lean management is the identification and elimination of waste, i.e. activities which drain resources and bring no value. The creators of the TPS concept defined seven categories of waste which underly the production process (Ohno, 1988, p. 129): defects, excess inventory, unnecessary motion, additional transportation, additional processing, waiting, and overproduction, which can be grouped into three key process groups of the Process Classification Framework by APQC (2020):

- procure materials and services (no. 4.2);
- production/manufacture/delivery of the product (no. 4.3);
- storage logistics management (no. 4.5).

Relating the key activities recommended by Lean management to the selected processes of common economic activities will facilitate the shaping of the Lean concept in official statistics. The process approach will be therefore a framework integrating the Lean concept in various areas of implementation.

3.4. Six Sigma – statistical methods in the service of excellence

In the process of developing the Lean concept, a need occurred to integrate it with a system of measures enabling the quantitative definition of goals and the measurement of deviations in their implementation (Shah & Ward, 2007). Such expectations were met by the Six Sigma approach, characterised as ‘a formalized and structured methodology for defining, measuring, analysing and controlling processes’ (Antony & Banuelas, 2002, p. 20). It is a data-based approach using a wide range of statistical methods and tools as well as the statistical design of experiments (Hahn et al., 2000, p. 318).

The integration of Lean and Six Sigma (Salah et al., 2010, p. 250) has thus become a natural combination of two complementary approaches: quantitative and organisational, where the elimination of waste and continued improvement are the common denominators.

3.5. Towards Lean public administration

The success of the Lean Six Sigma in the manufacturing sector has increased the interest of scholars and practitioners in the services sector. However, the transfer of

good practices and experiences cannot be unreflective (Rüttimann et al., 2014). There are significant differences between these two sectors, e.g. an advantage of production processes is their technological equipment. It provides fast and automated indicators which enable a precise determination of the level of waste. The following indicators prove useful in the above-mentioned process: the quantity and rotation of goods in the warehouse, machine downtime, the number of shortages, delays in delivery, or the amount of rejected products in the quality control process. A precise adjustment of the concept to the specificity of a given sector is required (Rüttimann et al., 2014). There are articles in scholarly literature which discuss the implementation of the Lean concept in a purely service-oriented environment, e.g. in call service centres (Piercy & Rich, 2009) where success was associated with the ability to apply Lean methods such as mapping of the value flow and with a focus on problem-solving. This demonstrates that the potential of the Lean concept applied in the services sector is considerable. Gupta et al. (2016, p. 1032) point to the dominating discourse in the literature on the advantages of Lean in healthcare. Moreover, their review of the literature shows that other services sectors such as IT, banking and education are also addressed and can benefit from the Lean concept. Other authors discuss the effectiveness of the concept in the services departments of manufacturing companies which were the first areas where the transfer from the manufacturing sector to the services sector took place (Huls, 2005; Maleyeff, 2006). Public administration also occupies a significant position in the scientific literature on Lean. This vast area is broken down into the following categories: health, education, local government, central government and the public sector as a whole (Rodgers & Antony, 2019, pp. 444–445). Hines et al. (2008) supplement the list above with the legal public sector. They highlight the benefits of applying selected techniques organising administrative tasks (Schiele & McCue, 2011, p. 224; Suarez Barraza et al., 2009, p. 143). These include 5S (Sort, Set in Order, Shine, Standardize, Sustain), which facilitate the organisation of administrative processes, process mapping, which enables looking at the actions taken from the perspective of the created value, series of meetings supporting the exchange of information and the continued improvement of processes, and statistical analyses of processes according to Six Sigma, allowing the elimination of problems at their source.

However, there has been some criticism voiced against the excessive concentration on the narrow issue of the implementation tools while ignoring the need to integrate the strategic vision with operational activities (Radnor & Osborne, 2013, pp. 272–273; Rodgers & Antony, 2019, p. 450). In addition, significant differences between the private and the public sector are emphasised, requiring caution when adopting the approach under different legal conditions (Scorsone, 2008, p. 64). Researchers also point to major barriers faced by units implementing the Lean

concept in public administration. Pedersen and Huniche (2011, p. 405) identify seventeen barriers – from insufficient resources, through employee resistance, to failing to document the benefits from the implementation of the Lean concept, and poor communication. Therefore, launching an improvement process involving the application of the Lean concept in public administration becomes a challenge resulting from little experience and a low number of good practices published in the literature on the subject, as well as the complexity of the matter that the implementing team has to deal with. The benefits, however, as indicated by researchers dealing with the Lean concept, are significant for the organisations adopting it, the users of public services and the sponsors, i.e. tax payers.

4. The Lean official statistics concept

4.1. Literature review

The exceptional popularity of the Lean concept both in the manufacturing and services sectors is worth paying attention to when adopting the idea in official statistics, which is faced with the challenges mentioned in the introduction. The literature on the subject presents discussions on the experiences gained during the implementation of this concept in Irish and Dutch statistics.

McSweeney and Moore (2015) discuss the Lean project conducted at the Central Statistics Office (CSO) of Ireland, launched in response to a budget cut. Its implementation started with pilot projects which provided an opportunity to gain expertise useful for its later full-scale introduction. Subsequently, employees were trained and a control system was designed to supervise the introduced changes. Next, the proposed Lean-based modifications were initiated. Two of them are presented in the article by McSweeney and Moore (2015). They concern key labour market and retail sales surveys, which confirms the determination of the management and the effectiveness of the applied tools.

The CSO of Ireland chose the classic approach to project implementation, focusing on obtaining survey outcomes in a shorter time while reducing both the errors and the use of resources. Classic Lean techniques and tools were applied in the project, which helped achieve the expected results. The article also points to the challenges that the implementation and maintenance of the concept entail. The need to engage senior management in the project and build close ties with employees were interesting conclusions. One of the employees' remarks concerned the foreign-sounding and unclear vocabulary used in the Lean Six Sigma (LSS) discourse, which resulted in the need to reshape the terminology and set the actual goals of the undertaken changes without additional verbal superstructure (McSweeney & Moore, 2015, p. 591), which, paradoxically, can be called a waste in internal communication.

Smekens and Zeelenberg (2015), in turn, present the activities undertaken by Dutch statistics which selected the optimisation of operational processes as the key method in adopting the Lean Six Sigma concept. They agreed with all the conclusions reached by McSweeney and Moore (2015), emphasising the importance of integrating the bottom-up² and top-down³ approaches. They also supplemented the list of factors which determined the successful implementation of LSS with their own experiences. They pointed out that achieving a culture of continued improvement goes far beyond the LSS method. The integration of Lean activities with the general quality policy becomes a must (Smekens & Zeelenberg, 2015, p. 585).

The positive evaluation of the LSS project presented in the comments (Biemer, 2015; Reedman, 2015) encourages further research work in this area, expanding the available knowledge of the implementation conditions and ways of adjusting the concept itself to the specific nature of official statistics. This information is certainly awaited by both the statisticians' community and the enthusiasts of the LSS philosophy.

4.2. Defining the Lean term for official statistics

Developing the definition proposed by Shah and Ward (2007, p. 791) for the needs of production processes, the term Lean in the field of official statistics will be understood as an integrated socio-technical system whose objective is to eliminate waste by concurrently reducing or minimising the variability of the information provider, information consumer, and the statistical organisational processes.

Proposing their definition of the term Lean, Shah and Ward (2007, p. 785 and 791) were motivated by the desire to standardise various approaches available in the literature and at the same time to bridge the gap between the philosophical perspectives of Lean concepts and their technical and tool-related implementations. For the purposes of this paper, the definition has been adjusted to a narrower perspective of official statistics by the transformation of the variability objects, i.e. of the supplier, recipient and internal processes into equivalents inherent in the official statistics activities, namely: the information provider, information consumer and the statistical organisational processes. These notions derive from the recognised process and data models described in two standards: the Generic Statistical Business Process Model (GSBPM) (United Nations Economic Commission for Europe [UNECE], 2019) and the Generic Statistical Information Model (GSIM) (UNECE, 2020),

² In this context, the term *bottom-up* means an approach to the optimisation of processes, starting with those carried out at the lowest organisational levels, moving towards the higher levels of the hierarchy.

³ In this context, the term *top-down* means an approach to process optimisation, starting from the highest levels of the organisational structure, progressing towards the lowest ones.

developed on behalf of the statistical community by UNECE. The information provider and information consumer are defined in GSIM, while the processes carried out in statistics in GSBPM.

The term socio-technical system, developing Dankbaar's idea (1997, p. 570 and 582), should be understood as the methodological and technical elements of statistical processes and semi-autonomous groups of employees operating in a high-motivation-high-innovation organisation. The term waste should be understood as activities engaging resources which do not bring significant value to the stakeholders of official statistics.

5. Lean implementation in the working conditions survey

5.1. Introduction to the working conditions survey

The underlying objective of the working conditions survey conducted by Polish official statistics is to assess the level of risk exposure of the employees of the national economy at their workstations. The collected data encompass risk categories and permissible exposure limits. The results of this survey, together with the outcomes of the related survey on accidents at work constitute the basis for the shaping of the safe working conditions policy in the national economy. The main addressees are: the ministries responsible for the labour market, referred to as ministries, the Social Security Institution, determining the amount of accident contributions for enterprises, the Central Institute for Labour Protection, conducting research on legal, economic, technical and organisational systems aimed to ensure that the employees' working conditions are safe and health-friendly, the scientific community interested in the analysis of the developments on the labour market in terms of occupational health and safety, and trade unions representing employees. Therefore, it can be assumed that this survey is of key importance to the shaping of an effective and efficient labour market while providing a safe environment for the labour force.

The working conditions survey has been conducted in Poland since the 1950s. Initially, the focus was on the costs incurred by reporting units in connection with the improvement of the working conditions. In the years that followed, the scope of the collected data was expanded by risks occurring in the work environment, along with a presentation of the discrepancies between the planned initiatives and the achieved results, which was in line with the needs of the economic policy pursued by the then authorities.

Significant changes to the survey were introduced at the turn of the century, following some momentous developments in the labour market regulations. The

Labour Code introduced the obligation to prepare an occupational risk assessment in the workplace, requiring the employer to identify, document and inform employees about workplace hazards. The accident insurance system, guaranteeing benefits in the event of the incapacity for work due to an accident at work or an occupational disease, was created in the framework of the social security system, which plays a significant role on the labour market. These changes led to the emergence of new key needs of the survey stakeholders.

Firstly, the Central Institute for Labour Protection stressed the need for reliable data on the preventive measures taken by enterprises, also on the scope of occupational risk assessment, its elimination or reduction, and the adopted measures. Secondly, both the ministries and the Social Security Institution were obliged to determine the amount of an accident insurance premium, which is established by ordinance and administrative decisions. The premium varied depending on the risk factors assigned to specific economic activities identified by the section and division of the Polish Classification of Activities (PKD). The risk factors are: accidents at work in total, severe and fatal accidents at work and employees at workstations where the permissible exposure limits are exceeded. The requirements resulting from the last point were transferred to the working conditions survey. In view of the scope of data thus outlined, the report for 2017⁴ consisted of five parts: the physical health risk factors at workstations where the permissible exposure limits are exceeded (based on the current tests and measurements), employees exposed to risk factors, preventive measures in a given reporting year – occupational risk assessment at workstations, benefits received due to exposure to a physical health risk factor, and compensation payments obtained due to accidents at work and occupational diseases. The statistical units in the survey included national economy entities operating in accordance with the PKD divisions (compliant with NACE Rev. 2), selected by the ministries and the Social Security Institution (GUS, 2020b, p. 25), employing over 9 workers.

5.2. Changes in the scope of data and statistical units

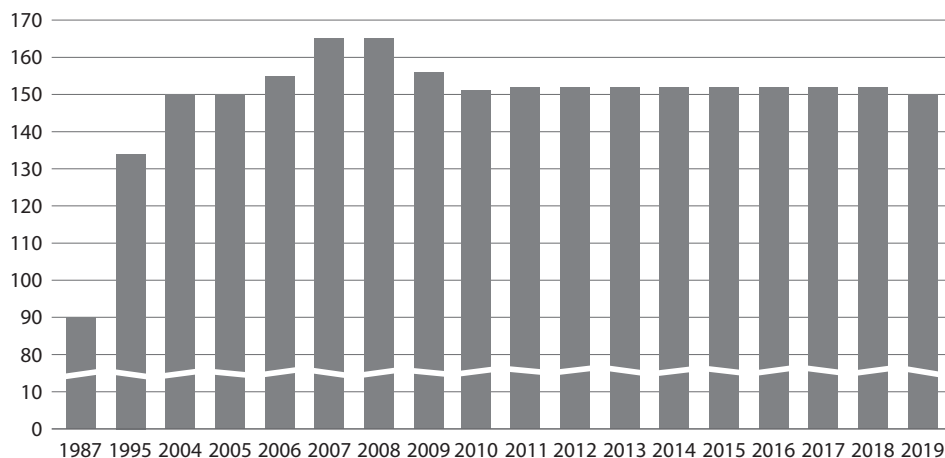
Over the years, i.e. during two decades starting from 1987, i.e. when the survey was launched, to 2017, which marks the beginning of the modernisation work, a constant increase was observed in terms of the scope of data, measured by the number of variables under study.⁵ In 1987, 90 variables were examined, while in 2017 there were already 152 variables (Figure 1). It is also noteworthy that the highest level was

⁴ The 2017 survey covered the largest number of collected variables. The modernisation works, discussed later in the article, began at that time.

⁵ The term collected variables is understood as the number of fields in the working conditions survey form to be filled in by the reporting unit.

achieved in 2007 and 2008, when 162 variables were collected, which resulted from the need to observe newly emerging phenomena specific to the labour market.

Figure 1. Number of variables in the working conditions survey



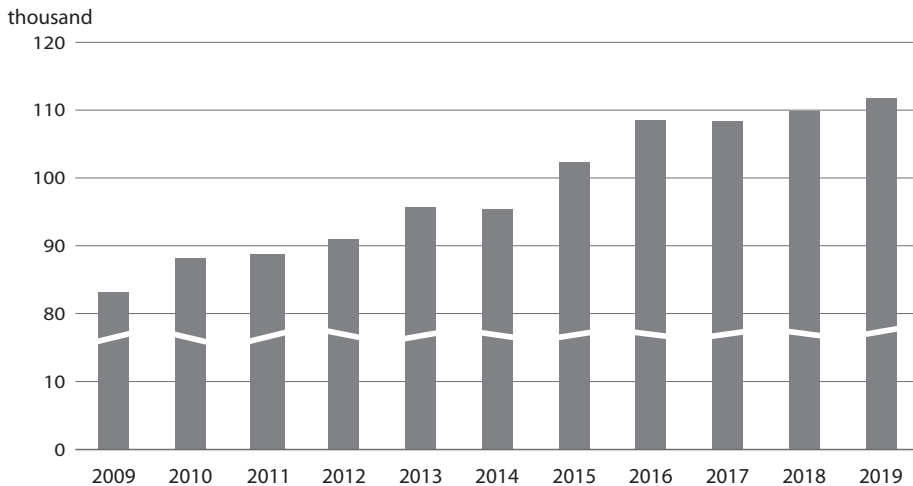
Source: author's work based on the working conditions survey reports.

There is an apparent desire to extend the survey to new areas every year, as the changes on the labour market are dynamic and the number of factors affecting working conditions is constantly growing. At the same time, the proposals to increase the scope do not go hand in hand with the review of the hitherto development, its usability or adaptation to the evolving circumstances.

A significant growth dynamic is also noticeable regarding the statistical units participating in the survey. Figure 2 illustrates the steady increase in the number of entities⁶ subject to survey in the decade starting in 2009, when the reporting obligation covered over 83,000 units, until 2019, when nearly 112,000 local units were included in the survey.

The growing number of the involved national economy entities results from the need to precisely identify the level of risks covering the ever-wider scope of PKD activities (compliant with NACE Rev. 2) required by the main stakeholders of the survey, such as the competent ministries and the Social Security Institution. It is justified by the necessity to precisely calculate the interest rate for the accident insurance premium.

⁶ It is worth emphasising that in the working conditions survey, the reporting obligation rests with a local unit (an enterprise or part thereof), which enables a spatial cross-section analysis of the phenomenon.

Figure 2. Number of units covered by the working conditions survey

Source: author's work based on GUS (2010–2020b).

The outlined tendency to increase the scope of the survey and thus involve a larger number of entities has become widespread in the sphere of social and economic surveys of official statistics; consequently, the working conditions survey also follows this trend. However, the observation above is no source of pride; on the contrary – it is an area which needs improvement involving the elimination of waste or an increase in efficiency, which are precisely identified by the Lean approach.

5.3. Assumptions regarding modernisation

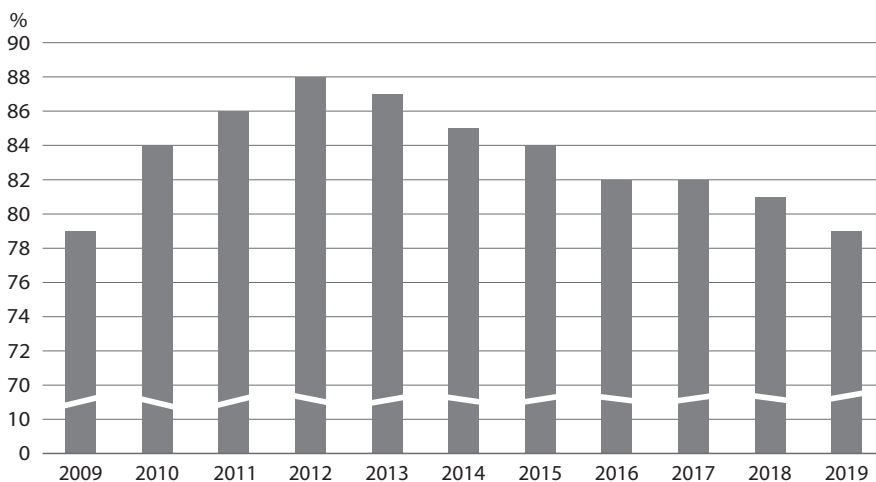
In 2017, a decision was made to initiate the modernisation of the working conditions survey with the aim to limit the scope of the collected data and the number of statistical units, while maintaining the relevance of the published data and their adjustment to the current needs. There were many reasons for this change, but the primary one was to limit the ever-increasing burden placed on the reporting entities and the employees of official statistics, discussed in detail in the introduction to this article. In addition, the growing costs of the survey alongside the decreasing outlays for current expenses accelerated the commencement of the project.

The selection of the organisational methods of the project was based on their major significance in the literature on the subject and the possibility of their integration with various processes of official statistics. The Lean concept was chosen, offering a wide array of good practices, with a well-established theoretical basis and providing the answer to the question how to do 'more for less'.

The modernisation activities focused on the principles of the Lean concept and the concept of the value stream connecting the survey stakeholders, i.e. the entities which submit reporting forms, official statistics, responsible for designing, collecting, analysing and publishing statistical information, and finally the users, including the ministries, the Social Security Institution, the Central Institute for Labour Protection, research units, trade unions and other organisations involved in monitoring working conditions. Official statistics serve here as the representative and arbiter of two opposing groups, i.e. entities completing reporting forms simultaneously demanding the limitation of the reporting obligation and the users expecting comprehensive, detailed and reliable statistical information.

Bearing in mind the precise value stream of the survey and its key stakeholders, it can be explicitly stated that the greatest workload is borne by the reporting entities. Another stakeholder, namely official statistics, will also benefit from the limitation of the survey. The number of entities included in the survey and the scope of the covered material translate directly into the time spent on monitoring and controlling the submitted reports. Only about 50% of the reporting entities meet their obligations within the set deadline. The others should be contacted, and any doubts clarified. As a result, the completeness ratio of 79% was achieved in 2019, calculated on the basis of the number of reports submitted to the number of entities covered by the survey. Figure 3 illustrates the changes in survey completeness taking place between 2009 and 2019.

Figure 3. Working conditions survey completeness



As Figure 3 shows, the ratio clearly follows a downward trend, falling from 88% in 2012 to 79% in 2019. This is a symptom of the increasing workload and the related costs of obtaining reports in the coming years, with no arising challenges being addressed.

Concentrating on the goal of reducing the burden borne by reporting entities through the limitation of the waste, as described in the definition of the term Lean for official statistics, four areas of activity are presented below, ordered according to the level of their readiness for implementation:

1. Obtaining data from administrative sources involves requesting public administration units which are in possession of data collected in the survey to submit them for further use in the process of preparing the publication on the results. This allows the elimination of variables from the report while maintaining the statistical information expected by the users.
2. Limiting the scope of data in the survey by eliminating variables which are not used in making key decisions or whose significance is not sufficiently justified. The decision as to which variables to eliminate was made jointly by the key stakeholders. The previously discussed phenomenon of the constant expansion of survey areas requires the assessment (in specific time cycles) of the relevance of the data collected earlier, where the criteria of their keeping should be precise and rigorous. There is a risk that the stakeholders, who do not incur the costs of the survey process, raise an unjustified claim to keep the unused data. As a result, a criterion was adopted in the working conditions survey stating that it is necessary to indicate relevant administrative decisions or a specific policy requiring statistical information for the data to be kept.
3. Changing the method for selecting reporting units from a full to a representative one allows the reduction of the number of units participating in the survey by at least half. However, preparing the design of the survey from a sample requires a precise adjustment of the sampling algorithm, whose quality is assessed by the estimation error rate.⁷
4. Access to the private information systems of the survey units enables the transfer of data collected in various transaction systems of the reporting units directly to official statistics, bypassing additional reporting forms and eliminating the workload of both the reporting entity and official statistics. Human labour is then not involved. Automated systems on both sides guarantee the quality, completeness and punctuality of data transmission. This method, although technically verified, is still in the initial stage of development. It requires a precisely defined organisational scope and a legal framework created for the

⁷ There is a wide range of issues which require a full clarification when discussing the proposed method, therefore, it will be the subject of a separate study.

needs of official statistics. The working conditions survey may become an effective setting for the verification of the assumptions adopted for the implementation of this method.

5.4. Work schedule

The work on the implementation of the Lean concept in the working conditions survey was divided into four stages which directly relate to the methods of reducing the burden imposed on the reporting entities as discussed above:

1. The modernisation of the survey began in 2017 with an acquisition of administrative data from the Social Security Institution regarding accidents at work and occupational diseases compensations, collected in section 5 of the report. Since 2018, the respondents have not been obliged to provide these data. The statistical information on this issue is included in the *Working conditions* (GUS, 2020b) publication and in statistical yearbooks. Thus, the number of variables has decreased by 13 items.
2. The second stage was carried out in the years 2019 to 2020 and involved the removal of section 4 of the report, relating to workers' benefits resulting from the exposure to a physical health risk factor. Consultations held with stakeholders indicated little interest in these data, not supported by clearly defined needs. Outdated ranges of the surveyed phenomena which caused many doubts and queries among the reporting entities were another argument for deleting the variables from this section. Owing to this reduction, the number of variables was decreased by another 14 items, which was greatly approved of by the reporting entities. As part of the initiative to limit the scope of data, the technique of continued improvement was introduced. It involved the annual verification of the relevance and precision of the collected data. This brought a change to section 3, which discusses the issues of the prevention and occupational risk assessment, crucial for the shaping of the national policy on safe working conditions. Five redundant variables were removed and the scope of the collected data was clarified, in the hope to receive fewer queries addressed to official statistics while completing the report.

The changes introduced in the first two stages allowed the elimination of 29 redundant variables even though the range of risk factors increased. The changes in the number of the analysed variables in the years 2018–2021 resulted in the removal of 19 items. As a result, the respondents filled in 133 variables in 2021.

3. The third stage consisting in the reduction of statistical units started in 2019 with the methodological groundwork aimed at changing the method of selecting units for the survey from full to representative. In 2021, the Methodological

Commission⁸ adopted the proposed solutions, combining the full representation for units reporting workplace hazards and a sample for the other entities. This results from the characteristics of the survey, where only 14–15% of the units report hazards in the workplace. As a result, about 40,000 units are subject to reporting obligation in 2021, which is a significant decrease from almost 112,000 in the previous year.⁹

4. The fourth stage, relating to the access to private information systems of the surveyed entities is planned to be developed and presented for approval after the third stage is implemented. Its aim is to prepare changes to the relevant legal framework, introducing the obligation to record workplace hazards electronically in accordance with the guidelines published by the Social Security Institution and the Central Institute for Labour Protection. An occupational risk assessment document would be the most appropriate for such a register, the form and content of which has not yet been regulated, although there is a statutory obligation to prepare it. For the reporting entities and official statistics, this would reduce the workload of filing statistical data, resulting from the reporting obligation.

Following the example of the Standard Audit File, the IT systems of enterprises would prepare reports using the data collected in risk assessments and send them to the statistical office against acknowledgement of receipt. At the same time the Social Security Institution would gain access to individual data kept by the employer, necessary for the individual calculation of the percentage rates of the accident insurance contribution. Such a system could also be used directly by the reporting entity, extending the survey stakeholders by occupational medicine. However, before this concept is put up for discussion, it must be carefully developed in terms of its organisation, process, and legal and technical aspects. The work on this issue was scheduled to start at the end of 2021.

6. Conclusions

Official statistics, like any other area of social and economic life, is subject to the constant pressure of the dynamically changing environment. The Lean concept implemented in official statistics may provide support in the creation of a new formula of self-organising teams of specialists undertaking projects that follow the needs announced by a wide spectrum of stakeholders quickly, effectively and efficiently.

⁸ The Methodological Commission appointed by Statistics Poland is responsible for initiating, monitoring, evaluating and improving methodology of statistical surveys conducted by the official statistics in Poland.

⁹ A detailed sampling scheme will be the subject of a separate publication.

This article has demonstrated the power of Lean in making this vision a reality. The paper presented the experimental process of implementing Lean statistics in the working conditions survey. The key stakeholders were identified based on the techniques proposed by the Lean concept. Next, the value stream was determined and the processes requiring reconstruction were specified, all in order to reduce the scope of data and the number of reporting entities in the survey. The reduction of the scope of data was twofold. Firstly, it was achieved by using data collected by the Social Security Institution for the sake of compensations granted due to workplace accidents and occupational diseases. Therefore, the respondents need not submit the same data any longer. Secondly, the data considered redundant have been eliminated from the survey, also reducing the stakeholders' obligations.

The scope of the reporting units will be limited after introducing scientific methods of selecting the surveyed units from a sample. A reduction of about 65% is envisaged. The optimisation of the survey designing processes in terms of the scope of data and reporting units enables a significant reduction in the burden imposed on both the reporting entities and the employees of official statistics. The range of the introduced changes included a continuous improvement consisting in an annual assessment of the usefulness of the variables under study and proposals for further optimisation using new, currently emerging concepts of access to private information systems of the surveyed entities. In effect, the answer to the research question posed in the Introduction is affirmative, i.e. the Lean concept can be successfully implemented in official statistics, where the available human and material resources are insufficient to fulfil the stakeholders' broad expectations.

Acknowledgements

I am grateful to Małgorzata Kruszewska, Milena Pragacz and Wiesława Bryłowska for their task-related and linguistic support.

References

- Antony, J., & Banuelas, R. (2002). Key ingredients for the effective implementation of Six Sigma program. *Measuring Business Excellence*, 6(4), 20–27. <https://doi.org/10.1108/13683040210451679>.
- APQC. (2020). *APQC (American Productivity & Quality Center) Process Classification Framework (PCF) – Cross Industry (Version 7.2.1, October 2020)*. <https://www.apqc.org/>.
- Biemer, P. (2015). Comments on the paper “Innovating to do more with less – the story of Lean Six Sigma in the Central Statistics Office, Ireland”. *Statistical Journal of the IAOS*, 31(4), 595–596. <https://doi.org/10.3233/sji-150927>.
- Dankbaar, B. (1997). Lean Production: Denial, Confirmation or Extension of Sociotechnical Systems Design?. *Human Relation*, 50(5), 567–583. <https://doi.org/10.1177/001872679705000505>.

- Główny Urząd Statystyczny. (2010). *Warunki pracy w 2009 r. / Working conditions in 2009*. https://stat.gov.pl/cps/rde/xbcr/gus/pw_warunki_pracy_2009.pdf.
- Główny Urząd Statystyczny. (2011). *Warunki pracy w 2010 r. / Working conditions in 2010*. https://stat.gov.pl/cps/rde/xbcr/gus/pw_warunki_pracy_2010.zip.
- Główny Urząd Statystyczny. (2012). *Warunki pracy w 2011 r. / Working conditions in 2011*. https://stat.gov.pl/cps/rde/xbcr/gus/PW_warunki_pracy_2011.zip.
- Główny Urząd Statystyczny. (2013). *Warunki pracy w 2012 r. / Working conditions in 2012*. <https://stat.gov.pl/obszary-tematyczne/rynek-pracy/warunki-pracy-wypadki-przy-pracy/warunki-pracy-w-2012-r-,1,7.html>.
- Główny Urząd Statystyczny. (2014). *Warunki pracy w 2013 r. / Working conditions in 2013*. <https://stat.gov.pl/obszary-tematyczne/rynek-pracy/warunki-pracy-wypadki-przy-pracy/warunki-pracy-w-2013-r-,1,8.html>.
- Główny Urząd Statystyczny. (2015). *Warunki pracy w 2014 r. / Working conditions in 2014*. <https://stat.gov.pl/obszary-tematyczne/rynek-pracy/warunki-pracy-wypadki-przy-pracy/warunki-pracy-w-2014-r-,1,9.html>.
- Główny Urząd Statystyczny. (2016). *Warunki pracy w 2015 r. / Working conditions in 2015*. <https://stat.gov.pl/obszary-tematyczne/rynek-pracy/warunki-pracy-wypadki-przy-pracy/warunki-pracy-w-2015-roku,1,10.html>.
- Główny Urząd Statystyczny. (2017). *Warunki pracy w 2016 r. / Working conditions in 2016*. <https://stat.gov.pl/obszary-tematyczne/rynek-pracy/warunki-pracy-wypadki-przy-pracy/warunki-pracy-w-2016-roku,1,11.html>.
- Główny Urząd Statystyczny. (2018). *Warunki pracy w 2017 r. / Working conditions in 2017*. <https://stat.gov.pl/obszary-tematyczne/rynek-pracy/warunki-pracy-wypadki-przy-pracy/warunki-pracy-w-2017-roku,1,12.html>.
- Główny Urząd Statystyczny. (2019). *Warunki pracy w 2018 r. / Working conditions in 2018*. <https://stat.gov.pl/obszary-tematyczne/rynek-pracy/warunki-pracy-wypadki-przy-pracy/warunki-pracy-w-2018-roku,1,13.html>.
- Główny Urząd Statystyczny. (2020a). *Struktura wynagrodzeń według zawodów w październiku 2018 r. / Structure of wages and salaries by occupations in October 2018*. <https://stat.gov.pl/obszary-tematyczne/rynek-pracy/pracujacy-zatrudnieni-wynagrodzenia-koszty-pracy/struktura-wynagrodzen-wedlug-zawodow-w-pazdzierniku-2018-roku,4,9.html>.
- Główny Urząd Statystyczny. (2020b). *Warunki pracy w 2019 roku / Working conditions in 2019*. <https://stat.gov.pl/obszary-tematyczne/rynek-pracy/warunki-pracy-wypadki-przy-pracy/warunki-pracy-w-2019-roku,1,14.html>.
- Gupta, S., Sharma, M., & Sunder, M. V. (2016). Lean services: a systematic review. *International Journal of Productivity and Performance Management*, 65(8), 1025–1056. <https://doi.org/10.1108/IJPPM-02-2015-0032>.
- Hahn, G. J., Doganaksoy, N., & Hoerl, R. (2000). The Evolution of Six Sigma. *Quality Engineering*, 12(3), 317–326. <https://doi.org/10.1080/08982110008962595>.
- Hines, P., Martins, A. L., & Beale, J. (2008). Testing the Boundaries of Lean Thinking: Observations from the Legal Public Sector. *Public Money & Management*, 28(1), 35–40. <https://doi.org/10.1111/j.1467-9302.2008.00616.x>.

- Holweg, M. (2007). The genealogy of lean production. *Journal of Operations Management*, 25(2), 420–437. <https://doi.org/10.1016/j.jom.2006.04.001>.
- Huls, K. (2005). The Antioch Company brings lean into the office. *Journal of Organizational Excellence*, 24(4), 31–38. <https://doi.org/10.1002/joe.20068>.
- Kotarbiński, T. (1929). *Elementy teorii poznania, logiki formalnej i metodologii nauk*. Ossolineum.
- Lander, E., & Liker, J. K. (2007). The Toyota Production System and art: making highly customized and creative products the Toyota way. *International Journal of Production Research*, 45(16), 3681–3698. <https://doi.org/10.1080/00207540701223519>.
- MacFeely, S. (2020). In search of the data revolution: Has the official statistics paradigm shifted?. *Statistical Journal of the IAOS*, 36(4), 1075–1094. <https://doi.org/10.3233/SJI-200662>.
- Maleyeff, J. (2006). Exploration of internal service systems using lean principles. *Management Decision*, 44(5), 674–689. <https://doi.org/10.1108/00251740610668914>.
- McSweeney, K., & Moore, K. (2015). Innovating to do more with less – the story of Lean Six Sigma in the Central Statistics Office, Ireland. *Statistical Journal of the IAOS*, 31(4), 587–592. <https://doi.org/10.3233/sji-150929>.
- Ohno, T. (1988). *Toyota Production System: Beyond Large-Scale Production*. Productivity Press.
- Pedersen, E. R. G., & Huniche, M. (2011). Determinants of lean success and failure in the Danish public sector: A negotiated order perspective. *International Journal of Public Sector Management*, 24(5), 403–420. <https://doi.org/10.1108/09513551111147141>.
- Piercy, N., & Rich, N. (2009). Lean transformation in the pure service environment: the case of the call service centre. *International Journal of Operations & Production Management*, 29(1), 54–76. <https://doi.org/10.1108/01443570910925361>.
- Radnor, Z., & Osborne, S. P. (2013). Lean: A failed theory for public services?. *Public Management Review*, 15(2), 265–287. <https://doi.org/10.1080/14719037.2012.748820>.
- Reedman, L. (2015). Discussant comments on the paper “Innovating to do more with less – the story of Lean Six Sigma in the Central Statistics Office, Ireland”. *Statistical Journal of the IAOS*, 31(4), 593–594. <https://doi.org/10.3233/sji-150928>.
- Rodgers, B., & Antony, J. (2019). Lean and Six Sigma practices in the public sector: a review. *International Journal of Quality & Reliability Management*, 36(3), 437–455. <https://doi.org/10.1108/ijqrm-02-2018-0057>.
- Rüttimann, B. G., Fischer, U. P., & Stöckli, M. T. (2014). Leveraging Lean in the Office: Lean Office Needs a Novel and Differentiated Approach. *Journal of Service Science and Management*, 7(5), 352–360. <https://doi.org/10.4236/jssm.2014.75032>.
- Salah, S., Rahim, A., & Carretero, J. A. (2010). The integration of Six Sigma and lean management. *International Journal of Lean Six Sigma*, 1(3), 249–274. <https://doi.org/10.1108/20401461011075035>.
- Schiele, J. J., & McCue, C. P. (2011). Lean thinking and its implications for public procurement: moving forward with assessment and implementation. *Journal of Public Procurement*, 11(2), 206–239. <https://doi.org/10.1108/jopp-11-02-2011-b003>.
- Scorson, E. A. (2008). New Development: What are the Challenges in Transferring Lean Thinking to Government?. *Public Money & Management*, 28(1), 61–64. <https://doi.org/10.1111/j.1467-9302.2008.00621.x>.

- Shah, R., & Ward, P. T. (2007). Defining and developing measures of lean production. *Journal of Operations Management*, 25(4), 785–805. <https://doi.org/10.1016/j.jom.2007.01.019>.
- Sharp, L. M., & Frankel, J. (1983). Respondent Burden: A Test of Some Common Assumptions. *Public Opinion Quarterly*, 47(1), 36–53. <https://doi.org/10.1086/268765>.
- Smekens, M., & Zeelenberg, K. (2015). Lean Six Sigma at Statistics Netherlands. *Statistical Journal of the IAOS*, 31(4), 583–586. <https://doi.org/10.3233/SJI-150930>.
- Smith, W. K., & Lewis, M. W. (2011). Toward a theory of paradox: A dynamic equilibrium model of organizing. *Academy of Management Review*, 36(2), 381–403. <https://doi.org/10.5465/amr.2009.0223>.
- Stone, K. B. (2012). Four decades of lean: a systematic literature review. *International Journal of Lean Six Sigma*, 3(2), 112–132. <https://doi.org/10.1108/20401461211243702>.
- Suarez Barraza, M. F., Smith, T., & Mi Dahlgaard-Park, S. (2009). Lean-kaizen public service: an empirical approach in Spanish local governments. *The TQM Journal*, 21(2), 143–167. <https://doi.org/10.1108/17542730910938146>.
- Sugimori, Y., Kusunoki, K., Cho, F., & Uchikawa, S. (1977). Toyota production system and Kanban system Materialization of just-in-time and respect-for-human system. *International Journal of Production Research*, 15(6), 553–564. <https://doi.org/10.1080/00207547708943149>.
- Towill, D. R. (2010). Industrial engineering the Toyota Production System. *Journal of Management History*, 16(3), 327–345. <https://doi.org/10.1108/17511341011051234>.
- United Nations Economic Commission for Europe. (2019). *Generic Statistical Business Process Model GSBPM (Version 5.1, January 2019)*. <https://statswiki.unece.org/display/GSBPM>.
- United Nations Economic Commission for Europe. (2020). *Generic Statistical Information Model (GSIM): Communication Paper for a General Statistical Audience (Version 1.2, October 2020)*. <https://statswiki.unece.org/display/gsim/GSIM+v1.2+Communication+Paper>.
- Womack, J. P., & Jones, D. T. (1996). *Lean Thinking: Banish Waste and Create Wealth in your Corporation*. Simon and Schuster.
- Woodruff, R. B. (1997). Customer Value: The Next Source for Competitive Advantage. *Journal of the Academy of Marketing Science*, 25(2), 139–153. <https://doi.org/10.1007/bf02894350>.